UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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ams AG, AMS-TAOS USA INC.,
SAMSUNG ELECTRONICS AMERICA, INC., and
SAMSUNG ELECTRONICS CO. LTD.,
Petitioners

v.

JJL TECHNOLOGIES LLC and 511 INNOVATIONS, INC.,
Patent Owner

Case IPR2016-01818
U.S. Patent No. 7,113,283

PETITION FOR *INTER PARTES* REVIEW

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I. MANDATORY NOTICES

A. Real Parties-in-Interest

ams AG, AMS-TAOS USA Inc., Samsung Electronics America, Inc., and Samsung Electronics Co., Ltd. (collectively "Petitioners") are the real parties-in-interest to this proceeding.

U.S. Patent No. 7,113,283 (the "'283 Patent") is assigned to JJL Technologies LLC by an assignment dated July 27, 2007 and recorded on the same date at reel/frame 019597/0461. However, in the various court proceedings identified below, 511 Innovations, Inc. claims to be "the current owner by assignment of all rights, title, and interest in and under the '283 Patent."

B. Related Matters

The '283 Patent and other patents in the same patent family are currently being asserted against Petitioners in *511 Innovations, Inc. v. Samsung Telecommunications America, LLC*, No. 2:15-cv-01526 (E.D. Tex.). Other patents in the same patent family are also currently being asserted in: *511 Innovations, Inc. v. HTC America, Inc.*, No. 2:15-cv-01524 (E.D. Tex.); *511 Innovations, Inc. v. Microsoft Mobility Inc.*, No. 2:15-cv-01525 (E.D. Tex.); and *511 Innovations, Inc. v. Apple, Inc.*, No. 2:16-cv-00868 (E.D. Tex.).

In addition to this Petition, Petitioner is seeking *inter partes* review of related U.S. Patents Nos. 6,307,629, 6,490,038, 6,915,955, 7,110,096, 7,397,541, 8,472,012 and 8,786,844.

C. Counsel

Lead Counsel: Daniel E. Venglarik (Registration No. 39,409);

Backup Counsel: Jamil N. Alibhai (*pro hac vice* to be filed), Kelly P. Chen (*pro hac vice* to be filed), and Jacob L. LaCombe (Registration No. 63,036).

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E. Certification of Standing

Petitioners certify that the ’283 Patent is available for *inter partes* review and that Petitioners are not barred or estopped from requesting *inter partes* review on the grounds identified herein.

II. OVERVIEW OF CHALLENGE AND RELIEF REQUESTED

Petitioners challenge Claims 1, 3, 21-24 and 27 of the ’283 Patent as indicated below:

Ground 1: Claims 1, 3, 21-23 and 27 are obvious over JP ’028 in view of the TSL2XX Datasheets.

Ground 2: Claims 22-24 are obvious over JP ’028 and the TSL2XX Datasheets in view of Bayer and Banning.

Ground 3: Claims 1, 3, 21-23 and 27 are obvious over Eguchi.

Ground 4: Claims 22-24 are obvious over Eguchi in view of Bayer and Banning.

The above grounds create a reasonable likelihood that Petitioners will prevail with respect to at least one challenged claim. The arguments, charts, and evidence demonstrate that the challenged claims are unpatentable as obvious under 35 U.S.C. § 103. Petitioners request cancellation of the challenged claims.

III. THE ’283 PATENT

A. Overview of the ’283 Patent

The challenged claims are directed to the well-known idea of using optical sensors to measure the intensity of light reflected from the object, and then using the intensity measurements to determine information about the object. The patent generally discusses measuring the intensity of reflected light and using the measured intensity in an algorithm (run on the microprocessor) to determine the optical characteristics of the object. Ex. 1001, 3:28-4:27.

The ’283 Patent describes a probe that measures the intensity of reflected light to determine optical characteristics (e.g., color, “reflectivity” or luminance) of teeth. Ex. 1001, 4:19-23. As shown in Figure 1, light emitted by a light source 11 is carried by fiber optic 5 to probe body 2 and probe tip 1 to illuminate a patient’s teeth 20:

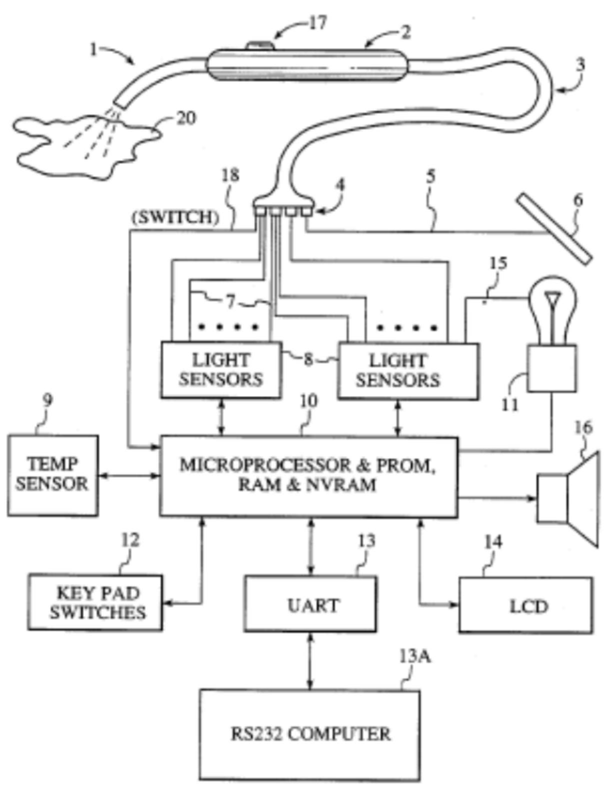


FIG. 1

Ex. 1001, Figure 1, 5:50-6:41; 6:49-56. “Light reflected from the object 20 passes through the receiver fiber optics in probe tip 1 to light sensors 8 (through probe body 2, fiber optic cable 3 and fibers 7).” Ex. 1001, 8:5-8. “Based on the information produced by light sensors [8], microprocessor 10 produces a color measurement result or other information to the operator." Ex. 1001, 7:46-48.

The patent explains that when one end of a fiber optic is illuminated by a light source, "[t]he fiber optic will emit a cone of light":

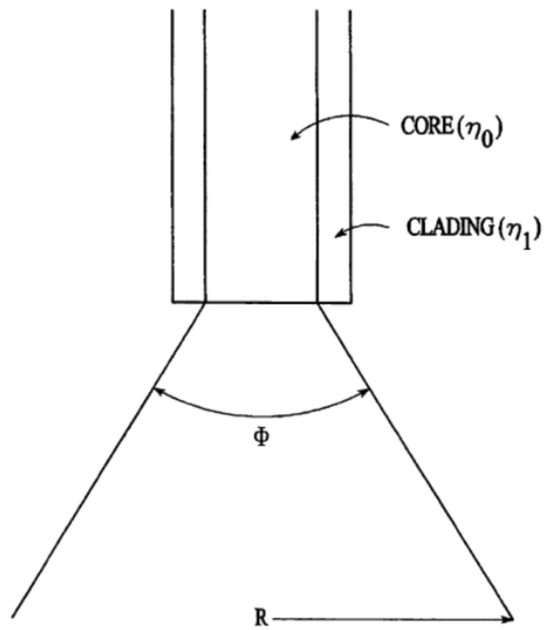


FIG. 4A

Ex. 1001, Figure 4A, 11:63-66. "If the fiber optic is held perpendicular to a surface it will create a circular light pattern on the surface." Ex. 1001, 11:66-12:1. As the fiber optic is raised from the surface, the circle of light grows larger, and as it is lowered the circle grows smaller. Ex. 1001, 12:1-3. The intensity of light "in the illuminated circular area increases as the fiber optic is lowered and will decrease as the fiber optic is raised." Ex. 1001, 12:4-4.

"The same principle generally is true for a fiber optic being utilized as a receiver." Ex. 1001, 12:7-8. As shown below, "[a]s . . . two [parallel] fiber optics are held perpendicular to a surface, the source fiber optic emits a cone of light that illuminates a circular area of radius r":

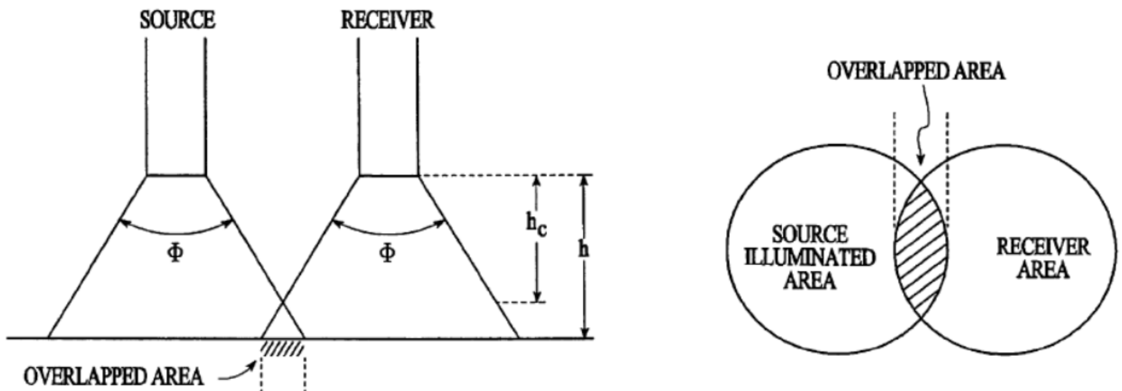


FIG. 4B FIG. 4C

Ex. 1001, Figures 4B-4C, 12:25-27. A receiver fiber optic also has an acceptance cone within which it can receive light. Ex. 1001, 12:28-30. Light reflected from an object's surface will only be received or propagated by the receiver fiber optic where light emitted from the source fiber optic strikes the object's surface in the "overlapped area." Ex. 1001, Figure 4C, 12:30-33..

As the source and receiver fiber optics are moved closer to an object's surface, they reach a point where their cones do not intersect, and the circular areas projected onto the object's surface do not intersect. There is thus no "overlapped area," and source light reflected by the object cannot be received or propagated by the receiver fiber optic. The height at which the source and receiver cones cease to intersect is referred to as the "minimal height." To account for the effects of distance and other variables of the probe, the patent describes a "critical height"—the distance from the probe to a specific object at which the intensity of reflected light is at its peak. Ex. 1001, 12:57-58. The patent teaches that when determining the optical characteristics of the object, values taken at the critical height should be used to eliminate the effect of distance on determination of such characteristics. See, e.g., Ex. 1001, 1:16-21, 2:16-21, 3:28-31,3:64-67, 13:8-11, 16:6-12.

Light reflected from an object passes through filters 22 and is presented to multiple sensing elements 24 of the light sensors 8. Ex. 1001, Figure 3, 8:63-65. The "sensing elements 24 include light-to-frequency converters, manufactured by Texas Instruments and sold under the part number TSL230." Ex. 1001, Figure 3, 8:66-9:1. These converters integrate light and "output an AC signal with a frequency proportional to the intensity (not frequency) of the incident light" and "the outputs of the TSL230 sensors are TTL or CMOS compatible digital signals." Ex. 1001, 9-2-5, 9:9-11. These output signals have "frequencies dependent on the light intensity presented to the particular sensing elements, which are presented to processor 26," and processor 26 "measures the frequencies of the signals output from sensing elements 24." Ex. 1001, 9:20-21.

To measure the frequency of each signal, the processor 26 implements a timing loop and periodically reads the states of each signal output from sensing elements 24 and a counter is incremented each time. Ex. 1001, 9:24-26. For each signal, after each reading, the processor 26 performs an XOR operation with the last data read. Ex. 1001, 9:29-31. The timing loop and multiple XOR operations continue until all input signals have changed twice (i.e., from 0 to 1 to 0, or, from 1 to 0 to 1)—"which enables measurement of a full ½ period of each input." Ex. 1001, 9:32-42. From the stored input bytes and internal counter values, the processor 26 can determine the period (and frequency) of the signals received from the sensing elements 24. Ex. 1001, 9:50-52. "Such periods calculated for each of the outputs of sensing elements is provided by processor 26 to microprocessor 10" which then calculates "a measure of the received light intensities." Ex. 1001, 9:52-56.

B. Admitted Prior Art

The '283 Patent admits prior art knowledge that color is dependent on the wavelength(s) of reflected light and that light incident on an object will, when reflected, "vary in intensity and wavelength dependent upon the color of the surface of the object." Ex. 1001, 1:31-35. Admitted prior art color measurement devices ("colorimeters") shine "white" light on the object and measure the intensity of reflected light received through filters passing only bands of wavelengths, such as red, green, and blue color filters. Ex. 1001, 1:39-43, 1:61-2:3. The intensity measurements from the three (red/green/blue) "color sensors" represent the color. Ex. 1001, 2:3-3. Admitted prior art light sensors such as the commercially available TSL230 or TSL213 and admitted prior art filter materials such as Kodak filters are disclosed for such system components. Ex. 1001, Figures 1 & 3, 8:66-9:1, 10:9-17.

IV. ORDINARY SKILL IN THE ART

A person of ordinary skill in the art at the time of the claimed inventions would have had a bachelor's degree in electrical engineering, physics, or a closely related field, along with at least 2-3 years of experience in the design and development of optoelectronic measurement systems. An individual with an advanced degree in a relevant field, such as physics or electrical engineering, would require less experience in the design and development of optoelectronic measurement systems.

V. CLAIM CONSTRUCTION

The '283 Patent expired on January 2, 2016. In reviewing a patent that has expired or will expire before the final decision, the Board applies the "district court" or *Phillips* claim construction standard. 37 C.F.R. § 42.100(b). Under that standard, the "correct" construction—that most accurately delineating the scope of the invention—is identified. *PPC Broadband, Inc. v. Corning Optical Communications RF, LLC*, 815 F.3d 734, 740 (Fed. Cir. 2016).

As shown below, the prior art renders obvious claims 1, 3, 21-24 and 27 of the ’283 Patent; accordingly, the Board need not construe any claim terms besides “first distance” for purposes of invalidity

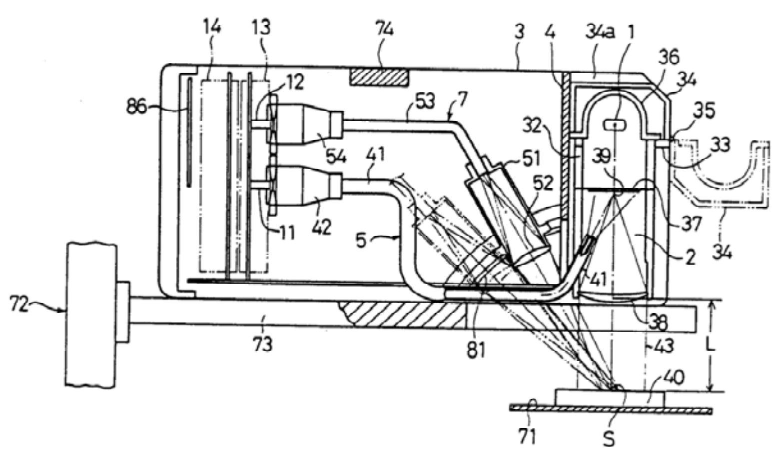
VI. GROUND 1: Claims 1, 3, 21 and 27 are obvious over JP ’028 in view of the TSL2XX Datasheets.

A. Overview of JP ’028

JP ’028 describes a non-contact colorimeter B to measure an object’s color and set a distance between the colorimeter and the object to be measured to a prescribed distance (to avoid inaccurate color measurement). Ex. 1003, Figure 6, 214-l[1], 220-l.

A xenon light source 1 emits light projected by lens 38 onto an object 40:

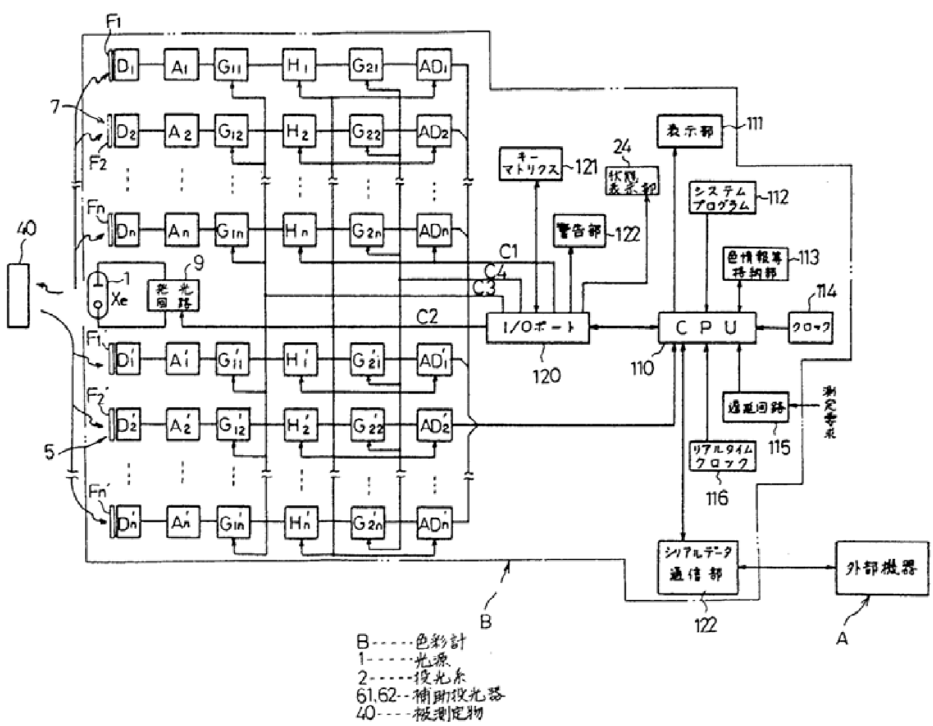
第 2 図



[1] For convenience, “l” and “r” are used to designate the left and right columns, respectively, on the indicated page.

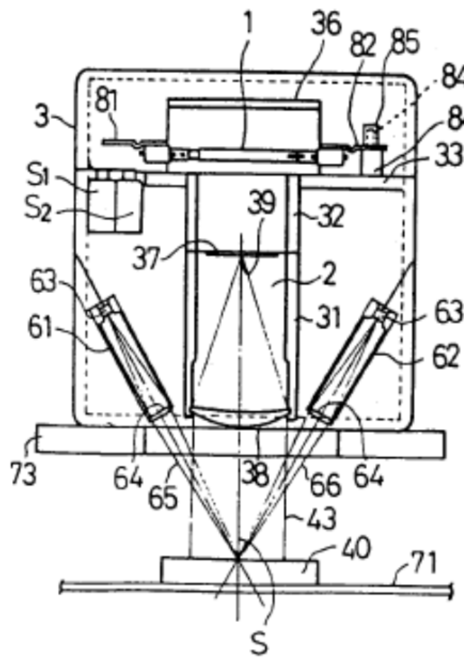
Ex. 1003, Figures 2-4, 215-r. A sample monitor 7 receives light (through a light receiving lens tube 51 and light receiving lens 52) reflected light from the object 40 which is coupled via optical fiber 53 and diffusion chamber 54 to a sensor 12. Ex. 1003, Figure 2, 216-l. Sensor 12 includes color component filters F_1'-F_n' for filtering light reflected from the object 40 and light color component detectors D_1'-D_n' for measuring the intensity of the color components of the received filtered light:

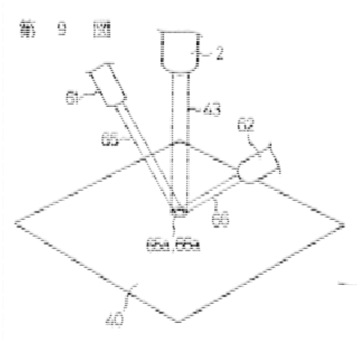
第 1 図

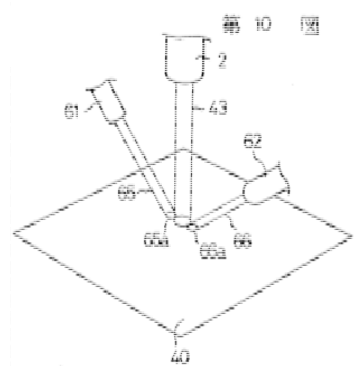


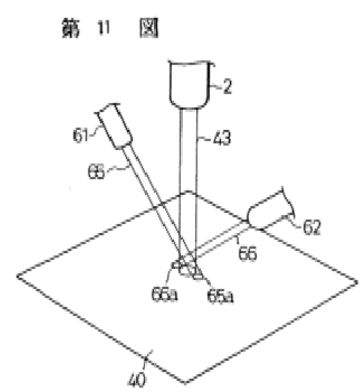
Ex. 1003, Figure 1, 217-r. The color component detectors D_1'-D_n' generate and output an electric signals corresponding to the intensity of the basic color components. The electric signals are amplified by amplification circuits A_1'-A_n', connected by gate circuits G_{11}'-G_{1n}' to sample and hold circuits H_1'-H_n', and are connected by gate circuits G_{21}'-G_{2n}' to A/D conversion circuits AD_1'-AD_n'. Ex. 1003, Figure 1, 218-l. These AD conversion circuits convert the electric signals corresponding to light intensity measurements into digital values. The CPU 110 receives the digital values for the measured color components of the reflected light (from the object). Ex. 1003, 218-r ("The photometric value of the respective basic color components converted into digital signals by the A/D conversion circuits AD_1-AD_n, AD_1'-AD_n' are input into the CPU 110."). The light intensity measurements made by the sensors 12 (and the sensor 11) enable object color to be determined based on the light reflected from the object 40. Ex. 1003, 220-l to 220-r.

To ensure object 40 is at measurement position S that is a prescribed distance L from input lens tube 51, two auxiliary light projectors 61, 62 emit light and are positioned so that the resulting optical paths 65, 66 intersect each other and the main optical path 43 at measurement position S:









Ex. 1003, Figure 12, Figures 9-11, 216-l to 216-r. Auxiliary projectors 61, 62 flash light along the optical paths 65, 66 of two colors different from each other and from the color of light from the main optical path 43 to enable determination of when the object is at the correct measurement position. Ex. 1003, 214-r to 215-l, 216-r, 216-r to 217-l. Light color component intensity measurements by sensor 12 allow determination of when the object 40 is at the prescribed distance L for accurate color measurement, when the spots 65a and 66a coincide with each other and the spot for beam 43. Ex. 1003, Figure 9, 216-r to 217-l. By analyzing the intensity for each reflected light color based upon one or both of the alternate flashing or different colors from auxiliary projectors 61, 62, the separation or overlap of the projected images 65a, 66a of light 65, 66 from projectors 61, 62 allow determination of an offset direction from the prescribed distance L. Ex. 1003, Figures 10-13, 216-r to 217-l.

B. JP ’028 and TSL230 Datasheet Render Claims 1, 3, 21, 23 and 27 Obvious

1. *Claim 1:*

[1a] “*A color sensing apparatus for determining a color characteristic of received light comprising:*”

A colorimeter determines a color characteristic of an object. Ex. 1003, Title, Figures 1-2, 10-13, 220-l to 220-r. The object 40 is illuminated by a light source 1 and the light reflected from the object 40 is received by light receiving lens 52. Ex. 1003, Figures 1-2, 216-l.

[1b] “*at least one light receiving input;*”

The object 40 is illuminated by a light source 1 and auxiliary light projectors 61, 62, and the light reflected from the object 40 is received by light receiving lens 52. Ex. 1003, Figures 1-2, 216-l.

[1c] “*a plurality of filter elements;*”

Color component filters F_1'-F_n'. Ex. 1003, Figure 1, 217-r.

[1d] "*a plurality of sensors wherein at least certain of the sensors receive light from the at least one input via a respective one of the filter elements,*"

Color component detectors D_1'-D_n' are light sensors. Ex. 1003, Figure 1, 217-r. The color component detectors D_1'-D_n' each receive reflected light through a light receiving lens tube 51 and the light receiving lens 52. Ex. 1003, Figures 1-2, 216-l, 217-r. The received light is coupled to the color component detectors D_1'-D_n' through the color component filters F_1'-F_n'. Ex. 1003, Figures 1-, 217-r.

[1e] "*wherein the sensors generate a plurality of signals having a frequency proportional to an intensity of light received by the at least one input;*"

Each of the detectors D_1'-D_n' receive reflected light from the object 40, measure the intensity, and generate corresponding electric signals that are further processed and converted into digital values and input to the CPU 110. Ex. 1003, Figure 1, 218-r to 219-l. Thus, JP '028 discloses multiple photodetectors that each generate and output an electric signal that is proportional to the light intensity received by the respective photodetector:

> The A/D conversion circuits AD_1-AD_n, AD_1'-AD_n', for example, convert the information from the sample holding into pulse duration

information and counts the gated clock during the interval of this pulse by a digital counter to convert to a digital signal.

Ex. 1003, 219. Photodetectors D_1'-D_n' output signals whose values are proportional to the light intensity received by each respective photodetector.

Admitted prior art—the commercially-available TSL230 device manufactured by Texas Instruments—is a photodetector sensor that generates and outputs a signal having a frequency proportional to the light intensity received. Ex. 1005, 5-3, 5-8.

The TSL230 sensors are light sensors that generate a signal having a frequency proportional to the light intensity received. Ex. 1005, 5-3, 5-8. The pulse interval period measurement technique taught by JP "'028 for digitizing light intensity measurements is directly applicable to digitizing the output of TSL230 sensors. In implementing each of photodetectors D_1'-D_n' in JP '028 using TSL230 sensors, the same A/D converters AD_1-AD_n, AD_1'-AD_n' may be employed to digitize the outputs of photodetectors D_1'-D_n', operating in the same manner to receive "pulse duration information and count[] the gated clock during the interval of this pulse by a digital counter to convert to a digital signal." Ex. 1016, ¶¶29, 30, 53.. Those having ordinary skill in the relevant art would be motivated to use the TSL230 sensor to implement photodetectors D_1-D_n and D_1'-D_n' in JP '028 for the purpose described (to measure the intensity of light reflected from the object). The design choice would require no more than ordinary skill and would produce the predictable result of an improved system providing high resolution light measurement, while operating in the manner described to detect light reflected from an object.

Utilization of the TSL230 sensors as each of photodetectors D_1-D_n and D_1'-D_n' will expectedly produce—in accordance with an intended purpose of the TSL230 devices—a signal having a frequency proportional to the intensity of light received.

[1f] "*wherein the color characteristic of the received light is determined based on the plurality of signals.*"

The digital values generated from light intensity color component measurements made by the photodetectors D_1'-D_n' are input to the CPU 110, which determines the color(s) reflected from the object. Ex. 1003, Figure 1, 219-l. The colorimeter of JP '028 "measures the numerical value of the color of an object to be measured from reflected light . . ." Ex. 1003, 213-r, 220-l (". . . , and the resulting color values (L*a*b) are outputted externally."). When TSL230 sensors are utilized as each of photodetectors D_1-D_n and D_1'-D_n', the color determination by the colorimeter will be based on the signals output by the TSL230 sensors.

2. *Claim 3:*

[3a] "*The apparatus of claim 1,*"

See discussion of Claim 1 above.

[3b] "*wherein the filter elements comprise a plurality of bandpass filters.*"

Each color component filter F_1'-F_n' passes a predetermined band or bands of wavelengths. Ex. 1003, Figure 1, 217-r, 218-l ("In the embodiment, n=3 is established and the three stimulus values, X,Y,Z, which are in the XYZ color specification."). Although JP '028 does not explicitly describe the color component filters F_1'-F_n' as being "bandpass" filters, these filters are inherently bandpass filters and/or function equivalently to bandpass filters. Those having ordinary skill in the relevant art understand that each of the filters F_1'-F_n' comprise a filter transmitting the respective basic color component spectral band. Ex. 1016, ¶ 29.

3. *Claim 21:*

[21a] "*The apparatus method of claim 1,*"

See discussion of Claim 1 above.

[21b] "*wherein light is provided from at least one light source on a probe*"

Light from light source 1 and from a light source 100 is coupled by optical fibers 61a, 62a to the auxiliary projectors 61, 62 is provided by the colorimeter (a probe) to the object. Ex. 1003, Figures 2-5, 216-l.

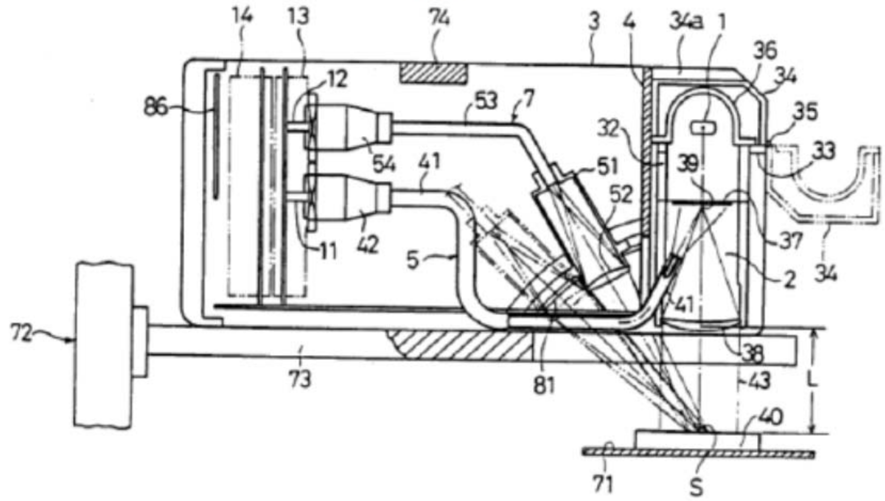
[21c] "*wherein light is received by at least one light receiver on the probe and coupled to the at least one input;*"

Light from the light source 1 and the light source 100 for auxiliary projectors 61, 62 is reflected off the object 40 and received by light receiving lens 52 and optical fiber 53. Ex. 1003, Figures 2 and 4, 216-l. A sample monitor 7 receives (through light receiving lens 52 and optical fiber 53) reflected light from the object 40. Ex. 1003, Figure 2, 216-l.

[21d] "*wherein the at least one light receiver has a spacing from the at least one light source,*"

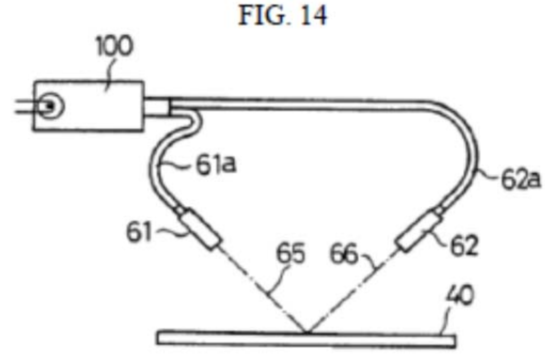
The object measurement monitor 7 receives light reflected off the object surface via light receiving lens 52 in light receiving lens tube 51 and optical fiber 53. Ex. 1003, Figures 2-4, 216. Light receiving lens 52 and lens tube 51 are spaced from the projecting lens 38 of the light source 1:

FIG. 2



Ex. 1003, Figure 2. The two auxiliary light projectors 61 and 62 receive light from a single source 100 via optical fibers 61a and 61b:

FIG. 14



Ex. 1003, Figures 2-4, 216, Figure 14, 217. Light receiving lens 52 and lens tube 51 are also spaced from the lenses 64 of the two auxiliary light projectors 61 and 62:

FIG. 3

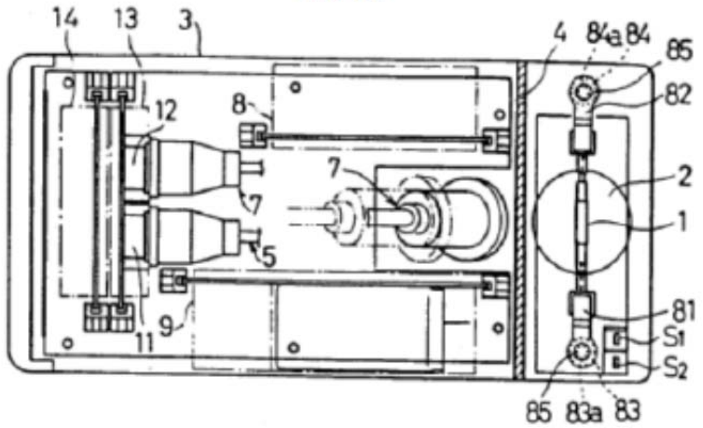
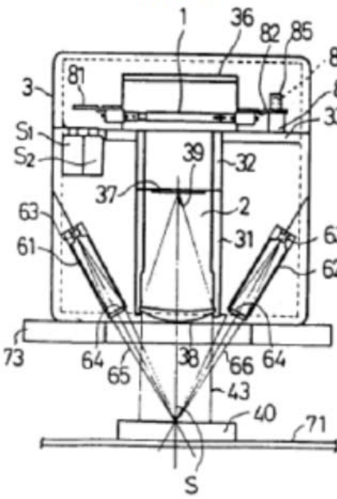


FIG. 4

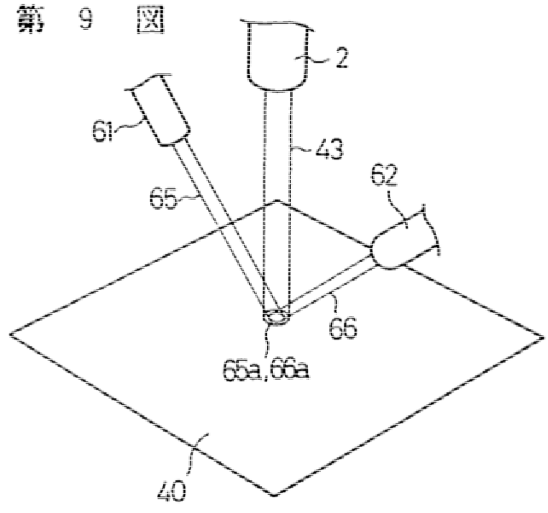


Ex. 1003, Figures 3 & 4.

[21e] "*wherein a first height is defined,*"

The spacing (and orientation) of the light receiving lens 52 and lens tube 51 from the projecting lens 38 of light source 1 and the projection lenses 64 of auxiliary light sources 61, 62 defines a prescribed height L from projecting lens 38 for the position S at which the object surface must be located for accurate color measurement:

第 9 図



> By this, when the relative distance of the machine body 3 and the object to be measured 40 is determined in order for the respective abovementioned optical paths 43, 65, 66 to accumulate at one point on the object to be mentioned 40, as shown in Figures 4 and 9, the machine body 3 and the object to be measured 40 have a positional relation appropriate for measurement.

Ex. 1003, Figure 9, 216. If the colorimeter B is not located at a prescribed distance L above the surface of the object 40 to be measured, corresponding to measurement position S, differences in the intensity of light from light source 1 reflected off the object surface may cause color measurements to be inaccurate:

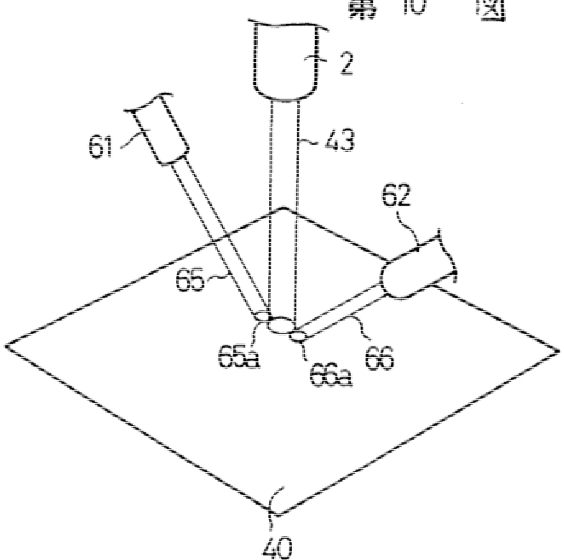
> As the projected light from the light source 1 onto the object to be measured has parallel rays, even if the projection distance from the projection lens 38 changes, the illumined area with uniform intensity of illumination does not change. However, in actuality if the prescribed distance is not set within a certain range, measurement cannot be carried out accurately due to the effect of changes in illumination intensity.

Ex. 1003, 216-l. The light receiving lens 52 has a focal area coinciding with the intersection of light path 1 and light paths 65, 66. Ex. 1016, ¶¶ 28, 47-51.

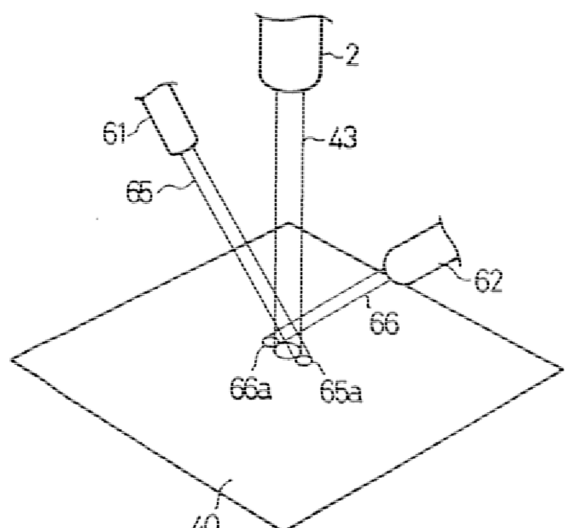
[21f] "*wherein, when the probe is a distance from a surface of an abject [sic] under evaluation that is less than the first height, light that is reflected from the surface of the object is not received by the at least one light receiver*."

When the object surface is at the correct measurement position S, the spots 65a and 66a from the light 65 and 66 projected by auxiliary projectors 61 and 62 will coincide on the object's surface, with each other and with the spot formed by the main optical path 43 from the light source 1. Ex. 1003, Figure 9, 216-l ("[T]he optical axis of the three optical paths coincide at the above mentioned position."). When the object surface is at some distance "below" (less than) the prescribed distance, the spots 65a and 66a will not coincide on the object's surface:

第 10 図



第 11 図



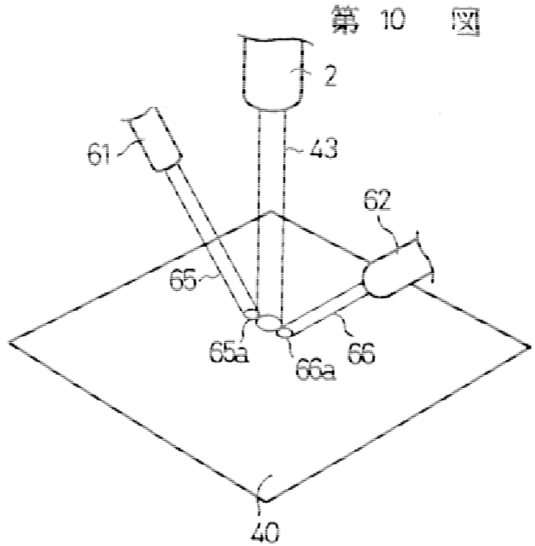
> If this position slips out of place, the projected images 65a, 66a of the respective projection optical paths 65, 66 on the object to be measured 40 separate corresponding to the amount and direction of this gap, as shown in Figures 10 and 11. So, the user can know that if the respective projection optical paths 65, 66 are separated as in Figure 10 then the measurement distance is too close and if they are separated as in Figure 11 the measurement distance is too far; by adjusting the relative distance of the machine body 3 and the object to be measured 40 on the side near the respective projection position, the respective projection position can determine the proper measurement distance coinciding with the object to be measured 40. Also, the projected light point of agreement where the projection images 65a, 66a accumulate, from the up and down optical change, this point of agreement is clearly demonstrated by the received optical image point of the light receiving lens tube 51 and the measurement image part of the point of agreement of the projection images 65a, 66a of the object to be measured 40.

Ex. 1003, Figures 10-11, 216-r.

"The light-receiving lens tube 51 is directed toward the measurement position [S]," and is adjustable along an arc centered on measurement position S.

Ex. 1003, Figure 2, 217. "[T]he projected light point of agreement where the projection images 65a, 66a accumulate, from the up and down optical change, this point of agreement is clearly demonstrated *by the received optical image point* of the light-receiving lens tube 51 and the measurement image part of the point of agreement of the projection images 65a, 66a of the object to be measured 40." Ex. 1003, 216. When the projected spots from the auxiliary light paths 65, 66 overlap with the spot from the main optical path 43, the object measurement monitor 7 may be employed to make fine adjustments to the colorimeter height to the prescribed distance L. "The accumulation of the projection optical images 65a, 66a can be clearly demonstrated and setting a minute distance can be carried out easily and accurately." Ex. 1003, 216.

When the surface of object 40 is at some distance less than L, light from the two auxiliary light projectors 61, 62 is not projected onto the focal area of lens 52 and is not received by sensor 12 within sample monitor 7 via optical fiber 53:



Ex. 1003, Figure 10, 216 ("[I]f the respective projection optical paths 65, 66 are separated as in Figure 10 then the measurement distance is too close . . ."); Ex. 1003, 216 ("Also, the projected light point of agreement where the projection images 65a, 66a accumulate, from the up and down optical change, this point of agreement is clearly demonstrated by the received optical image point of the light receiving lens tube 51 and the measurement image part of the point of agreement of the projection images 65a, 66a of the object to be measured 40.").

4. *Claim 22:*

[22a] "*The apparatus of claim 1*,"

See discussion of Claim 1 above.

[22b] "*wherein the filter elements comprise a red filter, a green filter and a blue filter*."

JP '028 discloses sensor 11 having component color filters F_1-F_n that analyze light for basic color components and these respective analyzed basic color components are photoelectrically converted to an electric signal by the basic color components detectors D_1-D_n. Sensor 12 also has component color filters F_1-F_n that analyze light reflected from object 40 and these respective analyzed basic color components are photoelectrically converted to an electric signal by the basic color components detectors D_1-D_n. In the embodiment, n = 3 is established and the three stimulus values X, Y, Z, which are in the XYZ color specification, are detected. Ex. 1003, Figure 1, 217-l to 217-r.

Although JP '028 does not explicitly describe the color component filters F_1-F_n as including a red filter, a green filter and a blue filter, the '283 Patent admits the prior art used red, green and blue filters to make measurements that are then converted to other tristimulus values, such as the XYZ values under the International Commission on Illumination (CIE) color specification:

> It is known that the color of an object can be represented by three values. For example, the color of an object can be represented by red, green and blue values, an intensity value and color difference values, by a CIE value, or by what are known as "tristimulus values"

> or numerous other orthogonal combinations. It is important that the three values be orthogonal; i.e., any combination of two elements in the set cannot be included in the third element.
>
> One such method of quantifying the color of an object is to illuminate an object with broad band "white" light and measure the intensity of the reflected light after it has been passed through narrow band filters. Typically three filters (such as red, green and blue) are used to provide tristimulus light values representative of the color of the surface. Yet another method is to illuminate an object with three monochromatic light sources (such as red, green and blue) one at a time and then measure the intensity of the reflected light with a single light sensor. The three measurements are then converted to a tristimulus value representative of the color of the surface. Such color measurement techniques can be utilized to produce equivalent tristimulus values representative of the color of the surface.

Ex. 1001, 1:53-2:7. The '283 Patent admits that the conversion between tristimulus color specifications such as RGB and XYZ was "conventional":

> [T]ristimulus type values may be readily computed (through, for example, conventional matrix math), or any other desired color values.

Ex. 1001, 10:58-60. The ’283 Patent further admits that suitable red, green and blue tristimulus filters were known in the art and commercially available:

> [T]he color filters are Kodak Sharp Cutting Wratten Gelatin Filters, which pass light with wavelengths greater than the cut-off value of the filter (i.e., redish values), and absorb light with wavelengths less than the cut-off value of the filter (i.e., bluish values). “Sharp Cutting” filters are available in a wide variety of cut-off frequencies/ wavelengths, and the cut-off values generally may be selected by proper selection of the desired cut-off filter.
>
> . . . .
>
> Three color receiver fiber optics are optically coupled to suitable tristimulus filters, such as red, green and blue filters.

Ex. 1001, 10:10-18, 17:63-65. Accordingly, those having ordinary skill in the relevant art would understand that red, green and blue filters may be employed for the three (n=3) color component filters F_1'-F_n' in JP ’028 to measure color and determine color coordinates within the XYZ color specification. Red, green and blue filters are one of a limited number of filter sets allowing determination of color according to a tristimulus color specification. Ex. 1016, ¶ 1078. Those skilled in the art would be motivated to use red, green and blue filters based on the (admittedly) ready commercial availability of such optical filter materials. Ex. 1016, ¶ 1078.

5. *Claim 23:*

[23a] "*The apparatus of claim 22,*"

See discussion of Claim 22 above.

[23b] "*wherein a red sensor is positioned to receive light via the red filter, a green sensor is positioned to receive light via the green filter, and a blue sensor is positioned to receive light via the blue filter.*"

JP '028 discloses detector D_1' positioned to receive light through color component filter F_1', detector D_2' positioned to receive light through color component filter F_2', and detector D_n' positioned to receive light through color component filter F_n'. Ex. 1003, Figure 1, 217-r. When the color component filters F_1'-F_n' are implemented as a red filter, a green filter and a blue filter in the manner and for the reasons discussed above, detectors D_1'-D_n' each comprise one of a red sensor, a green sensor and a blue sensor.

6. *Claim 27:*

[27a] "*A color sensing apparatus for determining a color characteristic of received light comprising:*"

See [1a] above.

[27b] "*at least one light receiving input;*"

JP '028 describes that the object 40 is illuminated by a light source 1 and the light reflected from the object 40 is received by light receiving lens 52. Ex. 1003, Figures 1-2, 216-l.

[27c] "*a plurality of filter elements;*"

Color component filters F_1'-F_n' are a plurality of filter elements. Ex. 1003, Figure 1, 217-r.

[27d] "*a plurality of light-to-frequency converter sensors, wherein at least certain of the sensors receive light from the at least one input via a respective one of the filter elements, wherein the sensors generate a plurality of signals having a frequency that varies based on the light intensity received by the sensors;*

Each of the detectors D_1'-D_n' receive reflected light from the object 40, measure the intensity, and generate corresponding electric signals that are further processed and converted into digital values and input to the CPU 110. Ex. 103, Figure 1, 218-r to 219-l. Thus, JP '028 discloses multiple photodetectors that each generate and output an electric signal that is proportional to the light intensity received by the respective photodetector:

The A/D conversion circuits AD_1-AD_n, AD_1'-AD_n', for example, convert the information from the sample holding into pulse duration

> information and counts the gated clock during the interval of this pulse by a digital counter to convert to a digital signal.

Ex. 1003, 219. Photodetectors D_1'-D_n' output signals whose values are proportional to the light intensity received by each respective photodetector.

The ’283 Patent’s admitted prior art—the commercially-available TSL230 device manufactured by Texas Instruments—is a photodetector sensor that generates and outputs a signal having a frequency proportional to the light intensity received. Ex. 1005, 5-3, 5-8.

In implementing each of photodetectors D_1'-D_n' in JP ’028 using TSL230 sensors, the same A/D converters AD_1-AD_n, AD_1'-AD_n' may be employed to digitize the outputs of photodetectors D_1'-D_n', operating in the same manner to receive “pulse duration information” and “count[] the gated clock during the interval of this pulse by a digital counter to convert to a digital signal.” Ex. 1016, ¶¶52, 53. Those having ordinary skill in the relevant art would be motivated to use the TSL230 sensor to implement photodetectors D_1-D_n and D_1'-D_n' in JP ’028 for the purpose described (to measure the intensity of light reflected from the object). The design choice would require no more than ordinary skill and would produce the predictable result of an improved system providing high resolution light measurement, while operating in the manner described to detect light reflected from an object.

Utilization of the TSL230 sensors as each of photodetectors D_1-D_n and D_1'-D_n' will expectedly produce—in accordance with an intended purpose of the TSL230 devices—a signal having a frequency proportional to the intensity of light received.

[27g] "*wherein the color characteristic of the received light is determined based on the plurality of signals.*"

The digital values generated from light intensity color component measurements made by the photodetectors D_1'-D_n' are input to the CPU 110 which determines the color(s) reflected from the object. Ex. 1003, Figure 1, 219-l. The colorimeter of JP '028 "measures the numerical value of the color of an object to be measured from reflected light . . ." Ex. 1003, 213-r, 220-l (". . . , and the resulting color values (L*a*b) are outputted externally.").

C. Charts

Limitation		JP '028+TSL230 Datasheet
1a	A color sensing apparatus for determining a color characteristic of received light comprising:	JP '028 discloses a colorimeter that determines color [a characteristic] of an object. Ex. 1003, Title, Figures 1-2, 10-13, 220-l to 220-r.
1b	at least one light receiving input;	JP '028 describes that the object 40 is illuminated by a light source 1 and the light reflected from the object 40 is received by light receiving lens 52. Ex. 1003, Figures 1-2, 216-l.
1c	a plurality of filter elements;	Color component filters F_1'-F_n'. Ex. 1003, Figure 1, 217-r.
1d	a plurality of sensors	Color component detectors D_1'-D_n' are light

Limitation		JP ’028+TSL230 Datasheet
	wherein at least certain of the sensors receive light from the at least one input via a respective one of the filter elements,	sensors. Ex. 1003, Figure 1, 217-r. The color component detectors D_1'-D_n' each receive reflected light through a light receiving lens tube 51 and the light receiving lens 52. Ex. 1003, Figures 1-2, 216-l, 217-r. The received light is coupled to the color component detectors D_1'-D_n' through the color component filters F_1'-F_n'. Ex. 1003, Figures 1-, 217-r.
1e	wherein the sensors generate a plurality of signals having a frequency proportional to an intensity of light received by the at least one input;	Each of the detectors D_1'-D_n' receive reflected light from the object 40, measure the intensity, and generate corresponding electric signals that are further processed and converted into digital values and input to the CPU 110. Ex. 1003, Figure 1, 218-r to 219-l. Thus, JP ’028 discloses multiple photodetectors that each generate and output an electric signal that is proportional to the light intensity received by the respective photodetector. Although, JP ‘028 does not explicitly disclose or teach the photodetectors D_1'-D_n' output an electric signal having a frequency proportional to the light intensity, JP 028’s photodetectors D_1'-D_n' do output signals whose values are proportional to the light intensity received by each respective photodetector. The ’283 Patent’s admitted prior art-the commercially-available TSL230 device manufactured by Texas Instruments-is a photodetector sensor that generates and outputs a signal having a frequency proportional to the light intensity received. Ex. 1005, pages 5-3, 5-8 (“The output can be either a pulse train or a square wave (50% duty cycle) with frequency directly proportional to light intensity” and “High-Resolution Conversion of Light Intensity to

Limitation		JP ’028+TSL230 Datasheet
		Frequency”). In substituting the TSL230 sensors for each of the photodetectors D_1'-D_n' in JP ’028, the sensors will each output a signal having a frequency proportional to the intensity of light reflected from object. Those having ordinary skill in the relevant art would be motivated to use the output of the TSL230 sensor for the same purpose as the output of the photodetectors D_1'-D_n' within the system of JP ’028, as a measure of the intensity of light reflected from the object. The design choice would require no more than ordinary skill and would produce the predictable result of an improved system in which fewer components and fewer analog devices are required with simpler and more predictable operation, while operating to detect light reflected from an object as described by JP ‘028, based on signals each having a frequency proportional to the intensity of received reflected light. Utilization of the TSL230 photo sensors in place of JP’s ’028 photodetectors D1′-Dn′ will expectedly produce—in accordance with an intended purpose of the TSL230 devices—a signal having a frequency proportional to the intensity of light received. Microprocessor 51 uses the digital value (“data”) of the light intensity measured by photodetectors 44 and 45 to determine a range [a characteristic] of the object or object’s surface to the ends of light receiving fibers 15 and 16. Ex. 1003, Figure 1, 4:59-65, 5:3-10, 5:67-6:6.
1f	wherein the color characteristic of the received light is determined based on the plurality of signals.	The digital values generated from light intensity color component measurements made by the photodetectors D_1'-D_n' are input to the CPU 110 which determines the color(s) reflected from the object. Ex. 1003, Figure 1,

Limitation		JP ’028+TSL230 Datasheet
		219-l. The colorimeter of JP ‘028 “measures the numerical value of the color of an object to be measured from reflected light . . .” Ex. 1003, 213-r, 220-l (“. . . , and the resulting color values (L*a*b) are outputted externally.”).
3a	The apparatus of claim 1,	See [1a]-[1f].
3b	wherein the filter elements comprise a plurality of bandpass filters.	Each color component filter F_1'-F_n' passes a predetermined band or bands of wavelengths. Ex. 1003, Figure 1, 217r, 218-l (“In the embodiment, n=3 is established and the three stimulus values, X,Y,Z, which are in the XYZ color specification.”). Although JP ‘028 does not explicitly describe the color component filters F_1'-F_n' as being “bandpass” filters, these filters are inherently bandpass filters and/or function equivalently to bandpass filters. Those having ordinary skill in the relevant art understand that each of the filters F_1'-F_n' comprise a filter transmitting the respective basic color component spectral band.
21a	The apparatus of claim 1,	See [1a]-[1f].
21b	wherein light is provided from at least one light source on a probe	JP ’028 describes light emitted from a light source 63 in the auxiliary projectors 61, 62 of the colorimeter B (a probe). Ex. 1003, Figures 2-5, 216-l.
21c	wherein light is received by a least one light receiver on the probe and coupled to the at least one input;	Light from the light source 63 of the auxiliary projectors 61, 62 (and from light source 1) is reflected off the object 40 and received by light receiving lens 52 and optical fiber 53. Ex. 1003, Figures 2 and 4, 216-l.
21d	wherein the at least one light receiver has a spacing from the at least one light source,	The object measurement monitor 7 receives light reflected off the object surface via light receiving lens 52 in light receiving lens tube 51 and optical fiber 53. Ex. 1003, Figures 2-4, 216. Light receiving lens 52 and lens tube 51 are spaced from the projecting lens 38 of

Limitation		JP ’028+TSL230 Datasheet
		the light source 1. Ex. 1003, Figure 2. The two auxiliary light projectors 61 and 62 may each include an LED light source 63 and a projection lens 64, or may receive light from a single source 100 via optical fibers 61a and 61b. Ex. 1010, Figures 2-4, 216, Figure 14, 217. Light receiving lens 52 and lens tube 51 are also spaced from the lenses 64 of the two auxiliary light projectors 61 and 62. Ex. 1003, Figures 3 & 4.
21e	wherein a first height is defined,	The spacing (and orientation) of the light receiving lens 52 and lens tube 51 from the projecting lens 38 of light source 1 and the projection lenses 64 of auxiliary light sources 61, 62 defines a prescribed height L from projecting lens 38 for the position S at which the object surface must be located for accurate color measurement. Ex. 1010, Figure 9, 216. If the colorimeter B is not located at a prescribed distance L above the surface of the object 40 to be measured, corresponding to measurement position S, differences in the intensity of light from light source 1 reflected off the object surface may cause color measurements to be inaccurate. Ex. 1003, 216-l.
21f	wherein, when the probe is a distance from a surface of an abject [sic] under evaluation that is less than the first height, light that is reflected from the surface of the object is not received by the at least one light receiver.	When the object surface is at the correct measurement position S, the spots 65a and 66a from the light 65 and 66 projected by auxiliary projectors 61 and 62 will coincide on the object’s surface, with each other and with the spot formed by the main optical path 43 from the light source 1. Ex. 1003, Figure 9, 216-l (“[T]he optical axis of the three optical paths coincide at the above mentioned position.”). When the object surface is not at the correct measurement position, the spots 65a and 66a will not coincide on the object’s surface, Ex. 1003, Figures 10-11, 216-r.

Limitation		JP ’028+TSL230 Datasheet
		When the surface of object 40 is at some distance less than L, light from the two auxiliary light projectors 61, 62 is not projected onto the focal area of lens 52 and is not received by sensor 12 within sample monitor 7 via optical fiber 53. Ex. 1003, Figure 10, 216 (“[I]f the respective projection optical paths 65, 66 are separated as in Figure 10 then the measurement distance is too close . . .”); Ex. 1003, 216 (“Also, the projected light point of agreement where the projection images 65a, 66a accumulate, from the up and down optical change, this point of agreement is clearly demonstrated by the received optical image point of the light receiving lens tube 51 and the measurement image part of the point of agreement of the projection images 65a, 66a of the object to be measured 40.”). No overlap between the auxiliary light spots 65a and 66a with each other and with the projected spot for the main optical path 43 exists, as generally illustrated by Figure 10.
22a	The apparatus of claim 1,	See [1a]-[1f].
22b	wherein the filter elements comprise a red filter, a green filter and a blue filter.	The ’283 Patent admits the prior art encompassed using red, green and blue filters to make measurements that are then converted to other tristimulus values, such as the XYZ values under the International Commission on Illumination (CIE) color specification, and that such conversion was “conventional.” Ex. 1001, 1:53-2:7, 10:58-60. The ’283 Patent further admits that suitable red, green and blue tristimulus filters were known in the art and commercially available. Ex. 1001, 10:10-18, 17:63-65. Accordingly, one skilled in the art would be motivated to employ red, green and blue filters one of a limited number of filter sets allowing determination of color according to a tristimulus color specification

Limitation		JP ’028+TSL230 Datasheet
		and/or based on the ready commercial availability of suitable red, green and blue optical filter materials.
23a	The apparatus of claim 22,	See [22a]-[22b].
23b	wherein a red sensor is positioned to receive light via the red filter, a green sensor is positioned to receive light via the green filter, and a blue sensor is positioned to receive light via the blue filter.	JP ’028 discloses detector D_1' positioned to receive light through color component filter F_1', detector D_2' positioned to receive light through color component filter F_2', and detector D_n' positioned to receive light through color component filter F_n'. Ex. 1003, Figure 1, 217-r. When the color component filters F_1'-F_n' are implemented as a red filter, a green filter and a blue filter in the manner and for the reasons discussed above, detectors D_1'-D_n' each comprise one of a red sensor, a green sensor and a blue sensor.
27a	A color sensing apparatus for determining a color characteristic of received light comprising:	See 1[a].
27b	at least one light receiving input;	See 1[b].
27c	a plurality of filter elements;	See 1[c].
27d	a plurality of light-to-frequency converter sensors wherein at least certain of the sensors receive light from the at least one input via a respective one of the filter elements, wherein the sensors generate a plurality of signals having a frequency that varies based on the intensity of light received by the sensors;	JP ‘028 describes a plurality of color component detectors D_1'-D_n' (sensors). Ex. 1003, Figure 1, 217-r. The color component detectors D_1'-D_n' each receive reflected light through a light receiving lens tube 51 and the light receiving lens 52. Ex. 1003, Figures 1-2, 216-l, 217-r. The received light is coupled to the color component detectors D_1'-D_n' through the color component filters F_1'-F_n'. Ex. 1003, Figures 1-, 217-r. Each of the detectors D_1'-D_n' receive reflected light from the object 40, measure the intensity, and generate corresponding electric

Limitation		JP ’028+TSL230 Datasheet
		signals that are further processed and converted into digital values and input to the CPU 110. Ex. 1003, Figure 1, 218-r to 219-l. Thus, JP ’028 discloses multiple photodetectors that each generate and output an electric signal that is proportional to the light intensity received by the respective photodetector. Although, JP ‘028 does not explicitly disclose or teach the photodetectors D_1'-D_n' are “light-to-frequency converter sensors” that output an electric signal having a frequency that varies based on the light intensity, JP 028’s photodetectors D_1'-D_n' do output signals whose values vary based on the light intensity received by each respective photodetector. The ’283 Patent’s admitted prior art – the commercially-available TSL230 device manufactured by Texas Instruments – is a light-to-frequency converter sensor that generates and outputs a signal having a frequency that varies (e.g., proportional) to the light intensity received. Ex. 1005, pages 5-3, 5-8 (“The output can be either a pulse train or a square wave (50% duty cycle) with frequency directly proportional to light intensity” and “High-Resolution Conversion of Light Intensity to Frequency”). In substituting the TSL230 sensors for each of the photodetectors D_1'-D_n' in JP ‘028, the sensors will be “light-to-frequency converters” that each output a signal having a frequency that varies based on the intensity of light reflected from object. Those having ordinary skill in the relevant art would be motivated to use the output of the TSL230 sensor for the same purpose as the output of

Limitation		JP ’028+TSL230 Datasheet
		the photodetectors D_1'-D_n' within the system of JP ’028, as a measure of the intensity of light reflected from the object. The design choice would require no more than ordinary skill and would produce the predictable result of an improved system in which fewer components and fewer analog devices are required with simpler and more predictable operation, while operating to detect light reflected from an object as described by JP ’028, based on signals each having a frequency that varies based on the intensity of received reflected light. Since the TSL230 devices are light-to-frequency converter sensors that output a signal having a frequency that varies based on the intensity of the light, utilization of these devices in place of JP’s ’028 photodetectors D_1'-D_n' will expectedly produce a device meeting this claim element.
27e	wherein the color characteristic of the received light is determined based on the plurality of signals.	See 1[f].

VII. GROUND 2: Claims 22-24 are obvious over JP ‘028 and the TSL230 Datasheet in view of Bayer and Banning.

Ground 2 is not redundant of Ground 1 because it includes an additional claim (24) and because Bayer and Banning explicitly disclose red, green blue and clear filter segments.

A. Overview of Bayer and Banning

Banning describes color imaging for television displays using various patterns of red, blue, green and "white" (clear) filter segments. Ex. 1011, 9:42-67. Banning explains that the white filter segments are necessary because "the brightness of . . . any color can be matched by a spectral color to which a proportion of white light has been added." Ex. 1011, 3:24-27. "Pure spectral colors, without admixture of white light, are said to be 'saturated,' and, in proportion as white light is added, become less and less saturated." Ex. 1011, 3:27-29. Color characterizations using red, green and blue components should also account for the overall ("white") light intensity. Ex. 1011, 3:46-61.

Bayer discusses Bayer's color system. Ex. 1010, 2:1-4. As an alternative color system to the red, green, blue and white filter segments described in Banning, Bayer describes filter mosaics (now known as "Bayer filters" or "Bayer patterns") over a sensor array using only red, green and blue filter segments in unequal number, with more green filter segments included to account for luminance or overall intensity. Ex. 1010, 2:18-57.

B. JP '028, TSL230 Datasheet and Hannah Render Claims 22-24 Obvious

1. *Claim 22:*

[22a] "*The apparatus of claim 1,*"

See discussion of independent Claim 1 in Ground 1 above.

[22b] "*wherein the filter elements comprise a red filter, a green filter and a blue filter*."

JP '028 discloses component color filters F_1'-F_n' that analyze light reflected from object 40 and these respective analyzed basic color components are photoelectrically converted to an electric signal by the basic color components detectors D_1'-D_n'. In the embodiment, n = 3 is established and the three stimulus values X, Y, Z, which are in the XYZ color specification, are detected. Ex. 1003, Figure 1, 217-l to 217-r.

In an analogous art, Bayer and Banning describe color characterization systems. Bayer and Banning each describe filter segment patterns including red, green and blue filter segments. Ex. 1011, 9:42-67; Ex. 1010, 2:1-4, 2:18-57. Those skilled in the art would be motivated to use one of the filter segment patterns of Bayer or Banning to implement filters F_1-F_n and F_1'- F_n' in JP '028. Ex. 1016, ¶¶ 54-57. Both filter patterns account for overall luminance, allowing the colorimeter of JP '028 to more accurately characterize the color of the source light and the object.

2. *Claim 23:*

[23a] "*The apparatus of claim 22,*"

See discussion of Claim 22 above.

[23b] "*wherein a red sensor is positioned to receive light via the red filter, a green sensor is positioned to receive light via the green filter, and a blue sensor is positioned to receive light via the blue filter.*"

Bayer and Banning each describe filter segment patterns including red, green and blue filter segments. Ex. 1011, 9:42-67; Ex. 1010, 2:1-4, 2:18-57. Those skilled in the art would be motivated to use one of the filter segment patterns of Bayer or Banning to implement filters F_1-F_n and F_1'- F_n' in JP '028. Ex. 1016, ¶¶54-57. Both filter patterns account for overall luminance, allowing the colorimeter of JP '028 to more accurately characterize the color of the source light and the object. When red, green and blue filters are employed for filters F_1-F_n and F_1'- F_n' in JP '028, the respective detectors D_1-D_n and D_1'-D_n' in JP '028 form a red sensor receiving light via the red filter, a green sensor receiving the light via a green filter, and a blue sensor receiving the light via a green filter.

3. *Claim 24:*

[24a] "*The apparatus of claim 23,*"

See discussion of Claim 23 above.

[24b] "*further comprising a broadband sensor, wherein light received by the broadband sensor does not pass through the red filter, the green filter or the blue filter.*"

Banning describes filter segment patterns including red, green, blue and white filter segments. Ex. 1011, 9:42-67; Ex. 1010, 2:1-4. Those skilled in the art would be motivated add an additional detectors D_n, D_n' (n=4) to each of sensors 11, 12 with a corresponding clear filter F_n, F_n' in order to account for overall luminance, allowing the colorimeter of JP ’028 to more accurately characterize the color of the source light and the object. When clear filter is employed for each additional detector, the respective additional detector in JP ’028 forms a broadband sensor that does not receive light through the red, green or blue filters. .

C. Charts

Limitation		JP ‘028+Bayer+Banning
22a	The apparatus of claim 1,	See [1a]-1[f] in Ground 1 above.
22b	wherein the filter elements comprise a red filter, a green filter and a blue filter.	Bayer and Banning each describe filter segment patterns including red, green and blue filter segments. Ex. 1011, 9:42-67; Ex. 1010, 2:1-4, 2:18-57. Those skilled in the art would be motivated to use one of the filter segment patterns of Bayer or Banning to implement filters F_1-F_n and F_1'- F_n' in JP ’028. Both filter patterns account for overall luminance, allowing the colorimeter of JP ’028 to more accurately characterize the color of the source light and the object.
23a	The apparatus of claim 22,	See [22a] and [22b] above.
23b	wherein a red sensor is positioned to receive light via the red filter, a green sensor is positioned to receive light via the green filter, and a blue sensor is positioned to receive light via the blue filter.	Bayer and Banning each describe filter segment patterns including red, green and blue filter segments. Ex. 1011, 9:42-67; Ex. 1010, 2:1-4, 2:18-57. Those skilled in the art would be motivated to use one of the filter segment patterns of Bayer or Banning to implement filters F_1-F_n and F_1'- F_n' in JP ’028. Both filter patterns account for overall

Limitation		JP '028+Bayer+Banning
		luminance, allowing the colorimeter of JP '028 to more accurately characterize the color of the source light and the object. When red, green and blue filters are employed for filters F_1-F_n and F_1'- F_n' in JP '028, the respective detectors D_1-D_n and D_1'-D_n' in JP '028 form a red sensor receiving light via the red filter, a green sensor receiving the light via a green filter, and a blue sensor receiving the light via a green filter.
24a	The apparatus of claim 23, further comprising	See [23a] and [23b] above.
24b	a broadband sensor, wherein light received by the broadband sensor does not pass through the red filter, the green filter or the blue filter.	Banning describes filter segment patterns including red, green, blue and white filter segments. Ex. 1011, 9:42-67; Ex. 1010, 2:1-4. Those skilled in the art would be motivated add an additional detectors D_n, D_n' (n=4) to each of sensors 11, 12 with a corresponding clear filter F_n, F_n' in order to account for overall luminance, allowing the colorimeter of JP '028 to more accurately characterize the color of the source light and the object. When clear filter is employed for each additional detector, the respective additional detector in JP '028 forms a broadband sensor that does not receive light through the red, green or blue filters.

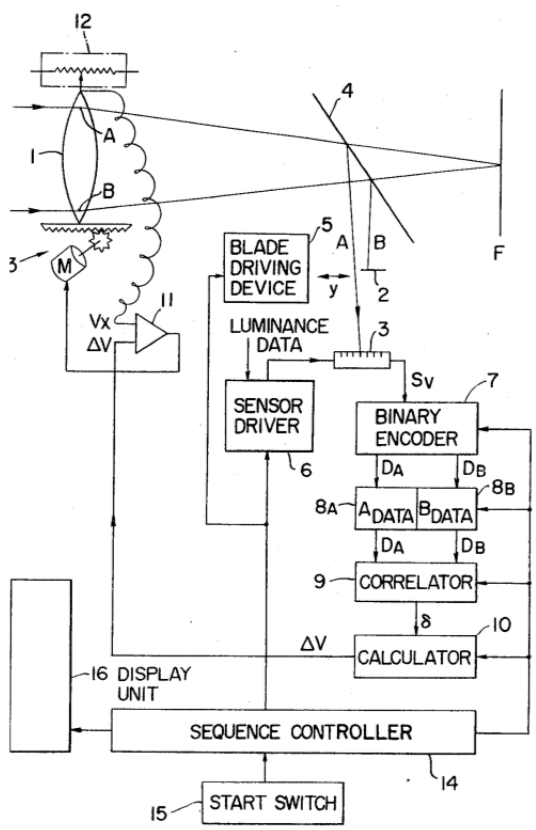
VIII. GROUND 3: Claims 1, 3, 21 and 27 are obvious over Eguchi.

This ground is not redundant with Grounds 1-2 because Eguchi discloses a light-to-frequency converter integral to the sensor control.

A. Overview of Eguchi

Eguchi describes a camera with an autofocus feature for a camera that determines a distance (in the form of a focusing position or focal length of the camera lens) to an object Σ based in part on the intensity of light reflected from the object. Ex. 1012 5:40-62. The camera receives light from an object out of focus via a lens 1 and half-mirror 4. The light is moved through a blade 2 to affect alternating light beams A and B at sensor array 3:

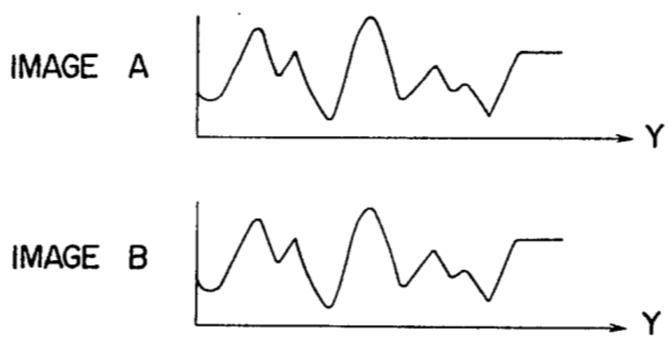
FIG. 9



Ex. 1012 Figures 1 & 9, 5:42-60. Instead of the blade, a static shutter such as a liquid crystal, a polarizing filter or a color stripe or color division filter may be employed. Ex. 1012, 5:60-62.

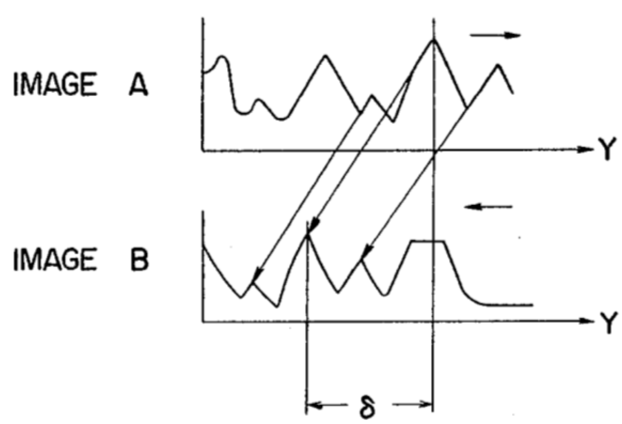
The sensor array 3 positioned along the focal plane determines distributions of light intensity (corresponding to light and dark regions of the object). When the lens is in the focus position, the images (light reflected from an object) passing through the edges A and B of the lens are aligned:

FIG. 6



Ex. 1012, Figure 6, 4:42-52. When the lens is not in the focus position, the images (light reflected from the object) passing through the edges A and B of the lens are offset, which offset can be used to determine the amount and direction of lens adjustment necessary to move the lens into the focus position:

FIG. 7

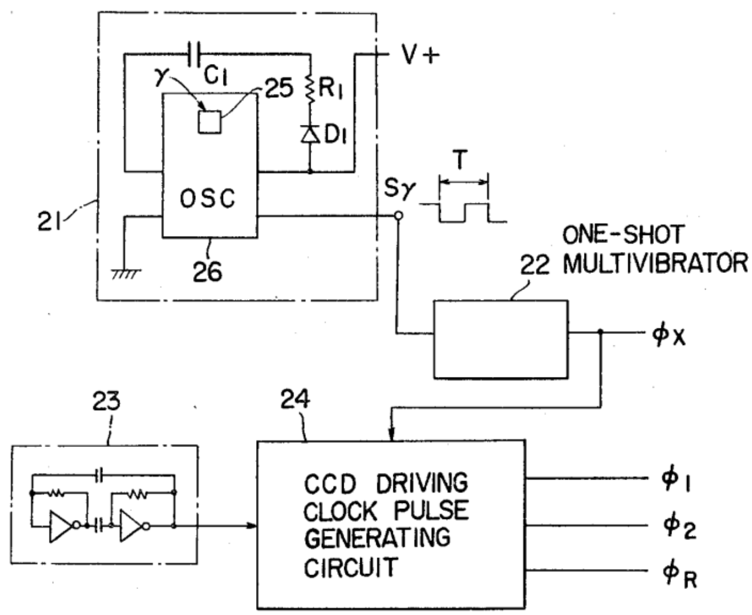


Ex. 1012, Figure 7, 4:53-5:41. The amount of movement of the lens is related directly to the amount of composite shift δ of the images A and B. Thus, the lens driving direction and distance to which the lens is moved for focusing can be detected.

The sensor array 3 (CCD image sensor array) converts light reflected from an object (the image of the object) into electrical signals which are output as a light intensity distribution signal (i.e., light intensity signal). The light intensity signal is converted into a digital binary signal and stored in data memory 8B. The sensor array 3 is driven by a sensor driver 6 to output the light intensity distribution signal that corresponds to the light intensity reflected from the object. Ex. 1012, 5:63-6:20.

The sensor driver 6 includes a light-to-frequency conversion circuit 21, a photocell 25 (light sensor), and various other circuit components:

FIG. 10



Ex. 1012, Figure 10, 6:60-7:13. The light-to-frequency conversion circuit 21 outputs "a square wave signal Sγ whose frequency varies with a quantity of incident light γ" wherein "the period T of the square wave signal Sγ decreases with an increasing [sic] the quantity of incident light γ or increases with a decreasing quantity of incident light." Ex. 1012, Figure 10, 6:67-7:13. The square wave signal Sγ is utilized to generate a shift pulse ϕ_x signal having period T that drives the sensor array 3. Ex. 1012, Figures 10 & 11, 7:8-13. As a result, the sensor array 3 outputs (frame rate) the light intensity distribution signal reflected from the object (received image) at a rate proportional to the intensity of light received at the photocell 25. Ex. 1012, 7:21-27.

Another embodiment is shown in Figure 30, which includes a sensor array 101 (equivalent to sensor arrays 3A, 3B in Figure 22), a sensor driver 102, and a light-to-frequency conversion circuit 103. Ex. 1012, Figures 30 & 22, 14:24-37.

B. Eguchi Renders Obvious Claims 1, 3, 21 and 27

1. *Claim 1:*

[1a] "*A color sensing apparatus for determining a color characteristic of received light comprising:*"

Eguchi describes an autofocus feature for a camera [apparatus] that determines a distance to an object Σ based in part on the intensity of light reflected from the object. Ex. 1012, 5:46-62. Eguchi uses a color stripe filter or color division filter in place of the blade 2. Color stripe filters and color division filters separate (or "divide") light into its red, green and blue colored components. Ex. 1012, Figure 9, 5:42-60. Those having ordinary skill in the relevant art understand that color stripe filters and color division filters separate (or "divide") light into its red, green and blue colored components. *See*, *e.g.*, Ex. 1013, 1:29-55; Ex. 1016, ¶¶ 58, 59.

[1b] "*at least one light receiving input;*"

The camera includes an autofocus feature receiving light from an object of focus via a lens 1 and half-mirror 4 and around edges of a blade alternately shielding the sensor array 3 from light beams A and B. Ex. 1013, Figure 9, 5:42-60.

[1c] "*a plurality of filter elements;*"

Eguchi '523 describes using a color stripe filter or a color division filter over the CCD sensor array 3 in lieu of blade 2, for separating light beams A and B. Ex. 1012, 5:60-62. Those having ordinary skill in the relevant art understand that color stripe filters and color division filters separate (or "divide") light into its red, green and blue colored components. *See, e.g.*, Ex. 1013, 1:29-55. Color stripe filters and color division filters each comprise a plurality of filter portions having a wavelength dependent optical transmission property.

[1d] "*a plurality of sensors wherein at least certain of the sensors receive light from the at least one input via a respective one of the filter elements,*"

A sensor array 3 [optical sensor] is set at a position in conjugation with the position of the film surface F and in a direction corresponding to the Y-axis, to alternately receive the light beams A and B. Ex. 1012, Figure 9, 5:63-6:2. The sensor array 3 includes a linear array of sensors [plurality of sensing elements] from which a series of 128 intensity measurements for each of light beam A and light beam B are shifted out under the control of transfer pulses ϕ_1 and ϕ_2. Ex. 1012, Figures 12 & 17, 6:6-13, 7:21-27. Light received via the lens 1 and half-mirror 4 is coupled to the sensor array 3 through the color stripe filter or color division filter. Ex. 1012, Figure 9, 5:42-60.

[1e] "*wherein the sensors generate a plurality of signals having a frequency proportional to an intensity of light received by the at least one input;*"

Light-to-frequency conversion circuit 21 generates a signal having a frequency (period T) that is proportional to the light intensity received by the photocell 25 [light sensor].

In addition, Eguchi describes varying an accumulation time of the CCD sensor array 3 based on luminance (intensity) of light received from the object (the square wave signal Sγ output from light-to-frequency conversion circuit 21) and outputting an intensity distribution signal Sv corresponding to the intensity of received light:

> "An object is greatly variable in luminance. It is preferable to employ an accumulation mode CCD image sensor array in order to obtain signals in response to the variations in luminance of the object. Accordingly, in this embodiment, a CCD image sensor array is employed as the sensor array 3. The sensor array is driven by a sensor driver 6 (described later in detail) with its charge accumulation time being controlled so as to output serially an intensity distribution signal

Sv corresponding to the intensity of each light receiving point over a wide luminance range."

Ex. 1012, 6:3-13. The square wave signal Sγ is used to control the accumulation time for the CCD sensor array 3. Ex. 1012, Figures 9 & 10, 7:8-13. The output frequency of the intensity distribution signal Sv from the CCD sensor array 3 is based upon the frequency of the square wave signal Sγ. Thus, the sensor array 3 successively outputs signals corresponding to the light intensity distribution of the light reflected from the object (i.e., the received image) at a frame rate or frequency that is proportional to the light intensity received at sensor 25. Ex. 1012, Figure 12, 7:14-27. The intensity distribution signal Sv is therefore produced by the CCD sensor array with a frequency based upon the accumulation time based on the intensity of the light received by the CCD sensor array 3.

[1f] "*wherein the color characteristic of the received light is determined based on the plurality of signals.*"

Eguchi describes determining the intensity of light (luminance) reflected from the object (i.e., the intensity distribution signal Sv) and deriving a focus adjustment ΔV for the lens 1 corresponding to a distance of the object from the lens 1 and the correct focus. Ex. 1012. Figure 9, 5:63-6:44. In other words, the intensity distribution signal Sv is used to determine the distance of the object [characteristic] which is then used to perform autofocusing, and the intensity distribution signal Sv is based on output of the light-to-frequency conversion circuit 21. When a color stripe or color division filter is used, the luminance measurements will comprise a determination of the color characteristic of the received light.

2. *Claim 3:*

[3a] "*The apparatus of claim 1,*"

See discussion of Claim 1 above.

[3b] "*wherein the filter elements comprise a plurality of bandpass filters.*"

The color stripe filter or color division filter includes one or more portions covering a red band of wavelengths, one or more portions covering a green band of wavelengths, or one or more portions covering a blue band of wavelengths. Those having ordinary skill in the relevant art understand that color stripe filters and color division filters separate (or "divide") light into its red, green and blue colored components. *See*, *e.g.*, Ex. 1013, 1:29-55.

3. *Claim 21:*

[21a] "*The apparatus method of claim 1,*"

See discussion of Claim 1 above.

[21b] "*wherein light is provided from at least one light source on a probe"*

A camera [probe] receives light via the lens 1 and half-mirror 4. Ex. 1012, 5:46-60.

[21c] "*wherein light is received by at least one light receiver on the probe and coupled to the at least one input;*"

Those having ordinary skill in the relevant art understand that a light source (e.g., "flash") was commonly provided on such cameras prior to the critical date of the '283 Patent, to provide light to the object being photographed in low light situations. Ex. 1016, ¶60. Those having ordinary skill in the relevant art would be motivated to include a light source on the camera ("probe") described in Eguchi for that purpose. The design choice would require no more than ordinary skill and would produce a predictable result of a camera that has greater utility in low light situations.

[21d] "*wherein the at least one light receiver has a spacing from the at least one light source, wherein a first height is defined, wherein, when the probe is a distance from a surface of an abject [sic] under evaluation that is less than the first height, light that is reflected from the surface of the object is not received by the at least one light receiver*"

Eguchi describes a camera in which the correct focus position of the lens 1 conforms to the distance (“minimal height”) between the camera and the object Σ being photographed at which light reflected from the object Σ forms an object image Σ^1 that is in focus at the focal plane. Ex. 1013, Figure 1, 4:8-17. The lens focus position is incorrect when the object and camera are closer or further than the distance required for the object image Σ^1 to be in focus at the focal plane. Ex. 1013, Figs. 2-3, 4:18-35. Those having ordinary skill in the relevant art understand a light source providing light to the object Σ and the optical path of the lens 1 and half-mirror 4 at least partially define the correct focus position, at which light from the light source reflected off the object Σ will be received via the lens 1 by the half-mirror 4 and form an object image Σ^1 that is in focus at the focal plane.

4. *Claim 27:*

[27a] “*A color sensing apparatus for determining a color characteristic of received light comprising:*”

See discussion of element 1[a] in Claim 1 above.

[27b] “*at least one light receiving input;*”

See discussion of element 1[b] in Claim 1 above.

[27c] "*a plurality of filter elements;*"

See discussion of element 1[c] in Claim 1 above.

[27d] "*a plurality of light-to-frequency converter sensors, wherein at least certain of the sensors receive light from the at least one input via a respective one of the filter elements, wherein the sensors generate a plurality of signals having a frequency that varies based on the light intensity received by the sensors;*

Light-to-frequency conversion circuit 21 generates a signal having a frequency (period T) that is proportional to the light intensity received by the photocell 25 [light sensor].

In addition, Eguchi describes varying an accumulation time of the CCD sensor array 3 based on luminance (intensity) of light received from the object (the square wave signal Sγ output from light-to-frequency conversion circuit 21) and outputting an intensity distribution signal Sv corresponding to the intensity of received light:

> "An object is greatly variable in luminance. It is preferable to employ an accumulation mode CCD image sensor array in order to obtain signals in response to the variations in luminance of the object. Accordingly, in this embodiment, a CCD image sensor array is employed as the sensor array 3. The sensor array is driven by a sensor

driver 6 (described later in detail) with its charge accumulation time being controlled so as to output serially an intensity distribution signal Sv corresponding to the intensity of each light receiving point over a wide luminance range."

Ex. 1012, 6:3-13. The square wave signal Sγ is used to control the accumulation time for the CCD sensor array 3. Ex. 1012, Figures 9 & 10, 7:8-13. The output frequency of the intensity distribution signal Sv from the CCD sensor array 3 is based upon the frequency of the square wave signal Sγ. Thus, the sensor array 3 successively outputs signals corresponding to the light intensity distribution of the light reflected from the object (i.e., the received image) at a frame rate or frequency that is proportional to the light intensity received at sensor 25. Ex. 1012, Figure 12, 7:14-27. The intensity distribution signal Sv is therefore produced by the CCD sensor array with a frequency based upon the accumulation time based on the intensity of the light received by the CCD sensor array 3.

[27g] "*wherein the color characteristic of the received light is determined based on the plurality of signals.*"

The sensor array 3 includes a linear array of sensors [plurality of sensing elements] from which a series of 128 intensity measurements are shifted out under the control of transfer pulses ϕ_1 and ϕ_2. Ex. 1012, Figures 12 & 17, 6:6-13, 7:21-27. The output of sensor array 3 receiving light through a color stripe or color division filter provide a determination of the color characteristic of received light.

C. Charts

Limitation		Eguchi
1a	A color sensing apparatus for determining a color characteristic of received light comprising:	Eguchi discloses a camera and autofocus mechanism that determines the reflectance of (or light intensity reflected from) [a characteristic] an object. Ex. 1012, Figure 7, 4:53 to 5:41, 19:48-53.
1b	at least one light receiving input;	Light from the object of focus is received through a lens 1. Ex. 1012, Figure 9, 5:42-60. Alternatively, light received from the object (i.e., the image) is received at photocell 25. Ex. 1012, Figure 10, 6:60-7:13.
1c	a plurality of filter elements;	Eguchi describes some of the light ("bundles of rays passing through points A and B") received via the lens 1 and half-mirror 4 is directed toward sensor array 3. Ex. 1012, Figure 9, 5:46-60, 9:63-10:2.
1d	a plurality of sensors wherein at least certain of the sensors receive light from the at least one input via a respective one of the filter elements,	A sensor array 3 [optical sensor] is set at a position in conjugation with the position of the film surface F and in a direction corresponding to the Y-axis, to alternately receive the light beams A and B. Ex. 1012, Figure 9, 5:63-6:2. The sensor array 3 includes a linear array of sensors [plurality of sensing elements] from which a series of 128 intensity measurements for each of light beam A and light beam B are shifted out under the control of transfer pulses ϕ_1 and ϕ_2. Ex. 1012, Figures 12 & 17, 6:6-13, 7:21-27. Light received via the lens 1 and half-mirror 4 is coupled to the sensor array 3 through the color stripe filter or color division filter. Ex. 1012, Figure 9, 5:42-60.

Limitation		Eguchi
1e	wherein the sensors generate a plurality of signals having a frequency proportional to an intensity of light received by the at least one input;	Light-to-frequency conversion circuit 21 generates a signal having a frequency (period T) that is proportional to the light intensity received by the photocell 25 [light sensor]. In addition, Eguchi describes varying an accumulation time of the CCD sensor array 3 based on luminance (intensity) of light received from the object (the square wave signal Sγ output from light-to-frequency conversion circuit 21) and outputting an intensity distribution signal Sv corresponding to the intensity of received light: "An object is greatly variable in luminance. It is preferable to employ an accumulation mode CCD image sensor array in order to obtain signals in response to the variations in luminance of the object. Accordingly, in this embodiment, a CCD image sensor array is employed as the sensor array 3. The sensor array is driven by a sensor driver 6 (described later in detail) with its charge accumulation time being controlled so as to output serially an intensity distribution signal Sv corresponding to the intensity of each light receiving point over a wide luminance range." Ex. 1012, 6:3-13. The square wave signal Sγ is used to control the accumulation time for the CCD sensor array 3. Ex. 1012, Figures 9 & 10, 7:8-13. The output frequency of the intensity distribution signal Sv from the CCD sensor array 3 is based upon the frequency of the square wave signal Sγ. Thus, the sensor array 3 successively outputs signals corresponding to the light intensity distribution of the light reflected from the object (i.e., the received image) at a frame rate or frequency that is

Limitation		Eguchi
		proportional to the light intensity received at sensor 25. Ex. 1012, Figure 12, 7:14-27. The intensity distribution signal Sv is therefore produced by the CCD sensor array with a frequency based upon the accumulation time based on the intensity of the light received by the CCD sensor array 3.
1f	wherein the color characteristic of the received light is determined based on the plurality of signals.	The sensor array 3 includes a linear array of sensors [plurality of sensing elements] from which a series of 128 intensity measurements are shifted out under the control of transfer pulses ϕ_1 and ϕ_2. Ex. 1012, Figures 12 & 17, 6:6-13, 7:21-27. The output of sensor array 3 receiving light through a color stripe or color division filter provide a determination of the color characteristic of received light.
3a	The apparatus of claim 1,	See 1[a]-[1f].
3b	wherein the filter elements comprise a plurality of bandpass filters.	The color stripe filter or color division filter includes one or more portions covering a red band of wavelengths, one or more portions covering a green band of wavelengths, or one or more portions covering a blue band of wavelengths. Those having ordinary skill in the relevant art understand that color stripe filters and color division filters separate (or "divide") light into its red, green and blue colored components. *See*, *e.g.*, Suzuki, 1:29-55.
21a	The apparatus of claim 1,	See 1[a]-[1f].
21b	wherein light is provided from at least one light source on a probe	A camera [probe] receives light via the lens 1 and half-mirror 4. Ex. 1012, 5:46-60.
21c	wherein light is received by at least one light receiver on the probe and coupled to the at least one input;	Those having ordinary skill in the relevant art understand that a light source (e.g., "flash") was commonly provided on such cameras prior to the critical date of the '283 Patent, to provide light to the object being photographed in low light situations. Those having ordinary

Limitation		Eguchi
		skill in the relevant art would be motivated to include a light source on the camera ("probe") described in Eguchi for that purpose. The design choice would require no more than ordinary skill and would produce a predictable result of a camera that has greater utility in low light situations.
21d	wherein the at least one light receiver has a spacing from the at least one light source, wherein a first height is defined, wherein, when the probe is a distance from a surface of an abject [sic] under evaluation that is less than the first height, light that is reflected from the surface of the object is not received by the at least one light receiver.	Eguchi describes a camera in which the correct focus position of the lens 1 conforms to the distance ("minimal height") between the camera and the object Σ being photographed at which light reflected from the object Σ forms an object image Σ^1 that is in focus at the focal plane. Ex. 1012, Figure 1, 4:8-17. The lens focus position is incorrect when the object and camera are closer or further than the distance required for the object image Σ^1 to be in focus at the focal plane. Ex. 1012, Figs. 2-3, 4:18-35. Those having ordinary skill in the relevant art understand a light source providing light to the object Σ and the optical path of the lens 1 and half-mirror 4 at least partially define the correct focus position, at which light from the light source reflected off the object Σ will be received via the lens 1 by the half-mirror 4 and form an object image Σ^1 that is in focus at the focal plane.
27a	A color sensing apparatus for determining a color characteristic of received light comprising:	See 1[a].
27b	at least one light receiving input;	See 1[b].
27c	a plurality of filter elements;	See 1[c].
27d	a plurality of light-to-frequency converter sensors wherein at least certain of	Light-to-frequency conversion circuit 21 generates a signal having a frequency (period T) that is proportional to the light intensity

Limitation		Eguchi
	the sensors receive light from the at least one input via a respective one of the filter elements, wherein the sensors generate a plurality of signals having a frequency that varies based on the intensity of light received by the sensors;	received by the photocell 25 [light sensor]. In addition, Eguchi describes varying an accumulation time of the CCD sensor array 3 based on luminance (intensity) of light received from the object (the square wave signal Sγ output from light-to-frequency conversion circuit 21) and outputting an intensity distribution signal Sv corresponding to the intensity of received light: "An object is greatly variable in luminance. It is preferable to employ an accumulation mode CCD image sensor array in order to obtain signals in response to the variations in luminance of the object. Accordingly, in this embodiment, a CCD image sensor array is employed as the sensor array 3. The sensor array is driven by a sensor driver 6 (described later in detail) with its charge accumulation time being controlled so as to output serially an intensity distribution signal Sv corresponding to the intensity of each light receiving point over a wide luminance range." Ex. 1012, 6:3-13. The square wave signal Sγ is used to control the accumulation time for the CCD sensor array 3. Ex. 1012, Figures 9 & 10, 7:8-13. The output frequency of the intensity distribution signal Sv from the CCD sensor array 3 is based upon the frequency of the square wave signal Sγ. Thus, the sensor array 3 successively outputs signals corresponding to the light intensity distribution of the light reflected from the object (i.e., the received image) at a frame rate or frequency that is proportional to the light intensity received at sensor 25. Ex. 1012, Figure 12, 7:14-27. The

Limitation		Eguchi
		intensity distribution signal Sv is therefore produced by the CCD sensor array with a frequency based upon the accumulation time based on the intensity of the light received by the CCD sensor array 3.
27e	wherein the color characteristic of the received light is determined based on the plurality of signals.	The sensor array 3 includes a linear array of sensors [plurality of sensing elements] from which a series of 128 intensity measurements are shifted out under the control of transfer pulses ϕ_1 and ϕ_2. Ex. 1012, Figures 12 & 17, 6:6-13, 7:21-27. The outputs of sensor array 3 receiving light through a color stripe or color division filter provide a determination of the color characteristic of received light.

IX. GROUND 4: Claims 22-24 are obvious over Eguchi in view of Bayer and Banning.

This ground is not redundant with Grounds 1-3 because: it includes an additional claim element (24) not included in Grounds 1 and 3, and Eguchi teaches a CCD array similar to that of Bayer and Banning, rather than a set of discrete photodiode detectors as taught by JP ’028.

A. Eguchi in View of Bayer and Banning Render Claims 22-24 Obvious

1. *Claim 22:*

[22a] “*The apparatus of claim 1,*”

See discussion of Claim 1 in Ground 3 above.

[22b] "*wherein the filter elements comprise a red filter, a green filter and a blue filter*."

Eguchi does not explicitly describe the structure of the color division filter. Bayer and Banning each describe filter segment patterns for a color division filter including red, green, and blue filter segments, both accounting for total luminance of the light. Ex. 1011, 9:42-67; Ex. 1010, 2:1-4, 2:18-57. Those skilled in the art would be motivated to use one of the filter segment patterns of Bayer or Banning to implement the color division filter of Eguchi to more accurately characterize the received light, in particular to an auto-exposure feature suggested in Eguchi. Ex. 1016, ¶¶ 62-64.

2. *Claim 23:*

[23a] "*The apparatus of claim 22,*"

See discussion of Claim 22 above.

[23b] "*wherein a red sensor is positioned to receive light via the red filter, a green sensor is positioned to receive light via the green filter, and a blue sensor is positioned to receive light via the blue filter*."

When the red, green and blue filter segment patterns for a color division filter described in Bayer or Banning are employed, CCD sensor array elements in the array 3 within Eguchi will include a red sensor receiving light via the red filter segments, a green sensor receiving the light via the green filter segments, and a blue sensor receiving the light via the blue filter segments.

3. *Claim 24:*

[24a] "*The apparatus of claim 23,*"

See discussion of Claim 23 above.

[24b] "*further comprising a broadband sensor, wherein light received by the broadband sensor does not pass through the red filter, the green filter or the blue filter.*"

When the red, green, blue and white filter segment patterns for a color division filter described in Banning are employed, CCD sensor array elements in the array 3 within Eguchi will include a broadband sensor not receiving light through the red filter, the green filter, or the blue filter.

B. Charts

Limitation		Eguchi+Bayer+Banning
22a	The apparatus of claim 1,	See [1a]-[1f] in Ground 3 above.
22b	wherein the filter elements comprise a red filter, a green filter and a blue filter.	Eguchi does not explicitly describe the structure of the color division filter. Bayer and Banning each describe filter segment patterns for a color division filter including red, green, and blue filter segments, both accounting for total luminance of the light. Ex. 1011, 9:42-67; Ex. 1010, 2:1-4, 2:18-57. Those skilled in the art would be motivated to use one of the filter segment patterns of Bayer or Banning to implement the color division filter of Eguchi to more accurately characterize the received light, in particular to

Limitation		Eguchi+Bayer+Banning
		an auto-exposure feature suggested in Eguchi.
23a	The apparatus of claim 22,	See [22a] and [22b] above.
23b	wherein a red sensor is positioned to receive light via the red filter, a green sensor is positioned to receive light via the green filter, and a blue sensor is positioned to receive light via the blue filter.	When the red, green and blue filter segment patterns for a color division filter described in Bayer or Banning are employed, CCD sensor array elements in the array 3 within Eguchi will include a red sensor receiving light via the red filter segments, a green sensor receiving the light via the green filter segments, and a blue sensor receiving the light via the blue filter segments.
24a	The apparatus of claim 23, further comprising	See [23a] and [23b] above.
24b	a broadband sensor, wherein light received by the broadband sensor does not pass through the red filter, the green filter or the blue filter.	When the red, green, blue and white filter segment patterns for a color division filter described in Banning are employed, CCD sensor array elements in the array 3 within Eguchi will include a broadband sensor not receiving light through the red filter, the green filter, or the blue filter.

X. CONCLUSION

Claims 1, 3, 21-24 and 27 of the '283 Patent are unpatentable as obvious. Petitioner therefore requests *inter partes* review on Grounds 1-4 as well as cancellation of those claims.

Dated: September 14, 2016 Respectfully submitted,

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CERTIFICATE OF SERVICE UNDER 37 C.F.R. §§ 42.6(e)(4) and 42.105

The undersigned hereby certifies that a copy of the foregoing PETITION FOR INTER PARTES REVIEW and all exhibits identified herein are being served via Priority Mail Express on September 14, 2016 on:

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Registration No. 39,409

CERTIFICATE OF WORD COUNT UNDER 37 C.F.R. §§ 42.24(d)

The undersigned certifies that the word count of the foregoing PETITION FOR INTER PARTES REVIEW, starting with the "OVERVIEW OF CHALLENGE AND RELIEF REQUESTED" up to and including the last word of the "CONCLUSION," is 13,885.

Dated: September 14, 2016

/Daniel E. Venglarik/
Daniel E. Venglarik

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